

25X1

Approved For Release 2003/05/28 : CIA-RDP79B01709A000400030023-1

TOP SECRET

25X1

10 June 1970

MEMORANDUM FOR: Holders of COMIREX-M-95

SUBJECT : Annex to Minutes

25X1A

The attached briefing outline covers
[redacted] 30 April 1970 presentation to
COMIREX on the achievements of the Doppler beacon on
KH-4B Mission 1109 (4-21 March 1970). It is forwarded
as an Annex to COMIREX-M-95.

25X1A

[redacted]
~~Executive Secretary~~

Committee on Imagery Requirements and Exploitation

Attachment

25X1

Copy 501 102

NRO review(s)
completed.

GROUP 1: EXCLUDED FROM
AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

TOP SECRET

25X1

25X1

TOP SECRET

Annex to
COMIREX-M-95
30 April 1970

25X1

BRIEFING OUTLINE
DOPPLER BEACON ACHIEVEMENT
(KH-4B Mission 1109, 4-21 March 1970)

(Presented by [] DIA)

25X1A

I. 1109 was the first Doppler/KH-4 mission. Its purpose was to provide an improved geodetic positioning capability on a world-wide basis to support DoD ballistic missile targeting and to provide control for MC&G programs. The primary requirement is missile target positioning and the emphasis of the briefing was placed on this aspect although the impact on tactical positioning is also considered significant. The briefing was divided into two sections: (A) Background and (B) Results of the Preliminary Analysis by Army, Navy, and Air Force.

A. BACKGROUND

Graphic
Attachment

Explanation

- | | |
|---------|--|
| No. A-1 | Shows the Geodetic and Geophysical contribution to the ICBM CEP. The component of missile error budget to which Mission 1109 was directed is the target position on the World Geodetic System. The 1971 requirement is the accuracy to which the Doppler/KH-4 mission was primarily concerned. |
| No. A-2 | Summarizes the major decisions and the actions related to the Doppler/KH-4 program. As you will note, in November 1968 USIB agreed to program five Doppler/KH-4 missions. |

TOP SECRET

25X1

25X1

25X1

TOP SECRETAnnex to
COMIREX-M-95
30 April 1970Graphic
AttachmentExplanation

- No. A-3 Illustrates the direct targeting approach being used. The precise doppler generated ephemeris provides exposure station positions; vehicle orientation is provided through the stellar/terrain camera relationship and targets are measured on the frame camera. Using this technique positions can be derived for any point on the frame photography.
- No. A-4a, b, c. Shows the doppler station deployment as planned for Mission 1109. Each station with the exception of 895 was in place for this mission. The ellipse around each tracking station indicates the area of visibility down to 2° elevation for a satellite of 100 nautical miles. The ephemeris is determined by tracking the satellite from this world-wide network of stations.
- Before the decision was made to place the doppler on the KH-4 system a detailed analysis was made of the system's capability for providing geodetic positions.
- No. A-5 Depicts pre-1109 status of the 1400+ Category I targets which are the primary concern for target positioning. Of this number approximately 43 percent met the horizontal positioning requirement for 1971. This percentage changes somewhat from time to time but it is generally representative of the situation as it existed before Mission 1109.
- No. A-6 Shows graphically the specific requirement for 1109 for approximately 1124 Category I targets which did not meet the accuracy requirements and were submitted for collection.

TOP SECRET

TOP SECRET

Annex to

COMIREX-M-95

30 April 1970

Graphic
AttachmentExplanation

No. A-7

Depicts the requirements which were submitted for coverage of diagnostic points. These points for which the geodetic positions are known will be utilized to evaluate the accuracy of the system.

No. A-8

Illustrates location areas of the 4753 Category II targets were also submitted for collection. These targets are essentially soft targets and require positioning in the order of 1000 feet. Collection was requested primarily because 2000 of the targets had not been positioned and the direct method is a much easier way of accomplishing the positioning. Also in many cases the Category II targets become Category I targets and as such we wish to have the data available to take care of these contingencies.

TOP SECRET

TOP SECRET

Annex to
COMIREX-M-95
30 April 1970

II. The evaluation of Mission 1109 consisted of three primary areas of analysis:

- Target coverage - Did Mission 1109 attain cloud-free coverage for the targets of interest?
- Adequacy of the stellar photography - Do we have enough stars on the plates to provide accurate vehicle attitude?
- Confirmation of the doppler ephemeris - Was the satellite orbit accurately determined for the passes of interest?

B. PRELIMINARY ASSESSMENT RESULTS

Graphic Attachment

Explanation

No. B-1

Shows the flow of information from the control centers to the field and back again in the doppler network being used for ephemeris determination. This network is an outgrowth of the Navy TRANET system. Orbit alerts, timing information, and station analysis are provided from the Naval Weapons Laboratory through APL to the stations. Stations obtain tracking data and provide the information through the TRANET communication network back to APL who in turn provides the data to NWL for the purpose of ephemeris determination.

No. B-2

Provides a general analysis of the mission from the point of view of the doppler network. Although the mission was generally very successful some difficulty was experienced in the time frame of 14-18 March due to the deviation of the actual mission from that originally planned. The lack of a DMU firing resulted in some deviation which caused a loss of a little data in this time frame.

TOP SECRET

TOP SECRETAnnex to
COMIREX-M-95
30 April 1970Graphic
AttachmentExplanation

The approach used by Navy in determining the doppler ephemeris was to provide as precise a reduction as possible for each revolution during the mission. In order to provide as precise a solution for each revolution data was taken on the previous and the following revolutions as part of each reduction. As an example, for revolution 134 the data used began with station 106 on revolution 133 and continued through station 121 on revolution 135. This provided significant overlap between each of the revolutions throughout the mission.

No. B-3

Shows terrain/stellar camera system relationship. Another phase of the mission evaluation is the performance of the stellar cameras and the calibration of the stellar/terrain camera systems. Although the system is calibrated prior to launch, dynamic calibration is necessary after launch to determine if the terrain/stellar camera relationship is changed. This is accomplished by photographing the precise test range in Arizona and comparing the vehicle attitude derived from the precise geodetic points and that determined from the stellar cameras. Dynamic calibration was completed by Army and it has been determined that the initial calibration was satisfactory.

No. B-4

Shows the DISIC coverage 0-30 percent cloud-free from Mission 1109. As is evidenced from the graphic, the mission was an outstanding success--much more successful in fact than can be expected in future missions.

TOP SECRET

25X1

25X1

TOP SECRET

Annex to

COMIREX-M-95

30 April 1970

Graphic
AttachmentExplanation

No. B-5

Shows the success of the mission translated into satisfaction of target location requirements which were discussed earlier. Of the 1124 Category I targets submitted, 901 were covered and had adequate stellar information. Of this number, eight were dropped because of ephemeris difficulty leaving a total of 893 which were satisfied. The additional two rows on the graphic show the success achieved for the diagnostic points and the Category II targets. A word of caution is injected at this point to avoid being overly optimistic about the success of the mission. While true that a very large percentage of Category I targets were covered, this was in large part due to most of the large complex areas being covered. It is not expected that follow-on missions collecting against more scattered targets will be equally as successful. Also there are other requirements such as providing control for the mapping and control data bases which were not priority on Mission 1109.

No. B-6

Illustrates the remaining mission evaluation function which is to examine how the total error combines. This evaluation is accomplished by photographing known ground control and comparing this against the position determined from the direct targeting system. Thus far evaluations have been completed over the Arizona test range and over the Potsdam region in Germany.

No. B-7

Shows the horizontal and vertical differences as derived by ACIC for both of the areas. ACIC results were 130 feet Horizontal and 170 feet Vertical for the Arizona test range.

TOP SECRET

TOP SECRETCOMIREX-M-95
30 April 1970Graphic
AttachmentExplanation

In Potsdam the results were 220 feet Horizontal and 190 feet Vertical. It should be emphasized at this point that the results thus far were based on preliminary test of only two areas using limited number of points. While the comparisons are very encouraging, more extensive evaluation is necessary before over-all accuracy of the system can be determined.

No. B-8

Summary. While some difficulties were experienced, Mission 1109 can be considered an outstanding success. Approximately 79 percent of the Category I targets were covered and approximately 46 percent of the diagnostic and Category II targets were covered. Based on preliminary evaluation it appears that the system can achieve the requirement for target positioning which was established for the 1971 program (450 feet Horizontal and 300 feet Vertical). Before the actual system capability is determined much more analyses will be required.

TOP SECRET

25X1

SECRET

GEODETIC AND GEOPHYSICAL COMPONENTS OF ICBM CEP'S

EXPRESSED IN FEET

LAUNCH AREA — 90 PERCENT ASSURANCE
(ACCELEROMETER CALIBRATION/ABSOLUTE GRAVITY/
EARTH RADIUS, GEOIDAL SEP., POSITION, ETC)

GRAVITY MODEL — 90 PERCENT ASSURANCE
(GRAVITATIONAL CONSTANT/GM/,
LAUNCH REGION, GLOBAL)

TARGET POSITION ON WGS — 90 PERCENT ASSURANCE
HORIZONTAL
VERTICAL (CONTR. TO CEP)
(VERTICAL HEIGHT)*

TOTAL
90 PERCENT ASSURANCE
CEP (50 PERCENT ASSURANCE)

DIFFERENCE CAUSED BY RE-ENTRY ANGLE

1969	1971	1974
665	355	206
825	290	285
750	450	210
410	410	195
(300)	(300)	(150)
1360	825	450
750	450	250

25X1

TOP SECRET

25X1

Attach

25X1

to

SATELLITE DATA FOR WORLDWIDE POSITIONING ——— MILESTONES

NOV 68 TO MEET 450 FEET HORIZONTAL AND 300 FEET VERTICAL REQUIREMENT (90% ASSURANCE) BY 1970, USIB AGREES TO NRO ADDING DOPPLER BEACON TO 5 KH-4 MISSIONS BEGINNING IN SUMMER 1969 [REDACTED]

JAN-APR 69 REVIEW OF REQUIREMENT AND SCHEDULING PROBLEMS ESTABLISHES SCHEDULE OF 4 KH-4 DOPPLER MISSIONS BEGINNING IN MARCH 1970

JUL 69 DDR&E SUPPORTS 250 FEET CEP FOR G&G ERROR BUDGET BY 1974. CALLS FOR POSITIONING AT 210 FEET HORIZONTAL AND 150 FEET VERTICAL 90% ASSURANCE

DEC 69 USIB AGREES TO ADDING DOPPLER BEACONS TO 3 ADDITIONAL KH-4 MISSIONS FOR TOTAL OF 7 KH-4 MISSIONS WITH DOPPLER BEACON. ADVISED OF 210 FEET HORIZONTAL AND 150 FEET VERTICAL (90% ASSURANCE) TECHNICAL OBJECTIVE FOR 1974 FOR SUPPORT OF MISSILES; [REDACTED]

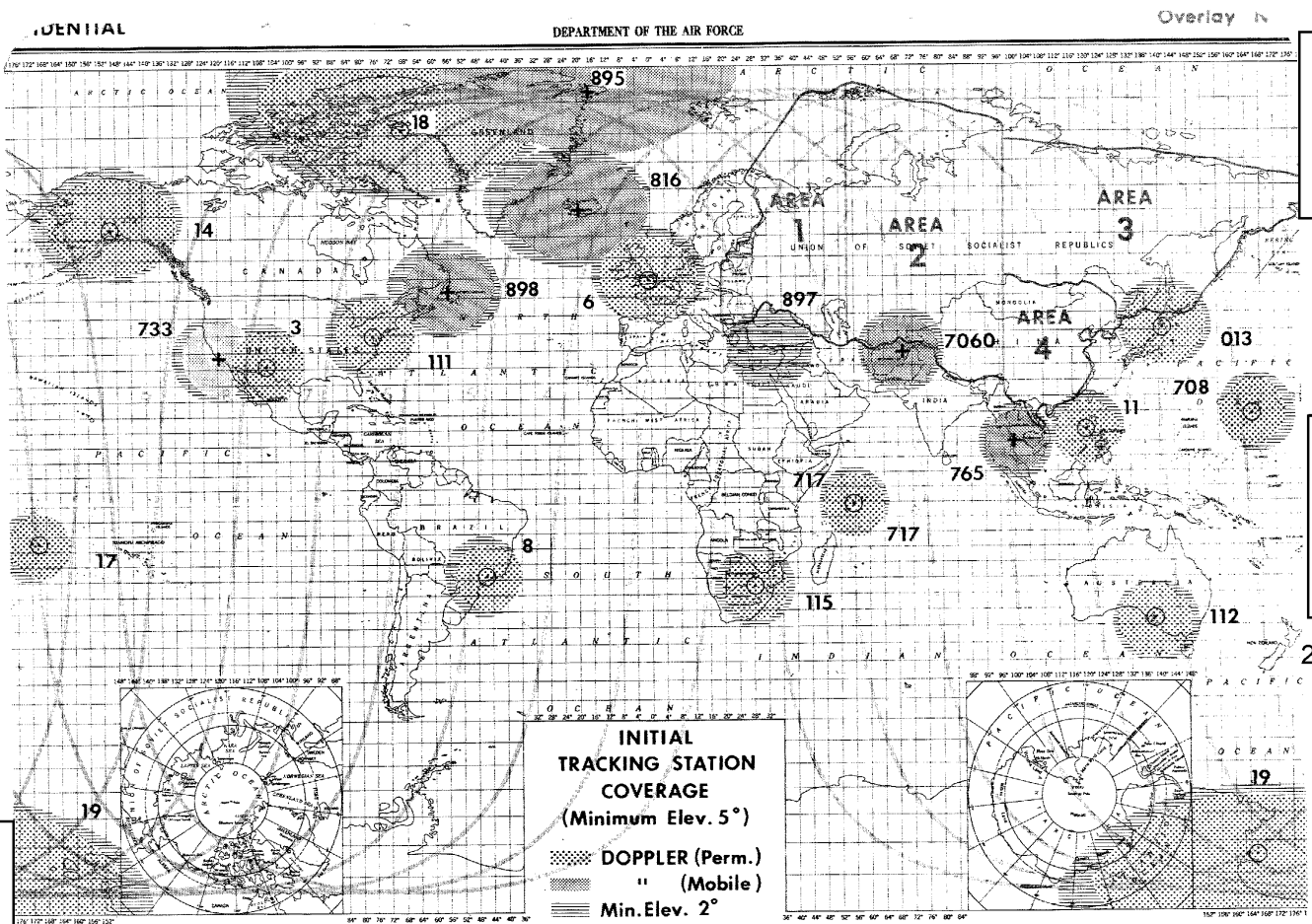
FEB 70 NRO FUNDING AND SCHEDULING PROBLEMS INDICATES SCHEDULING OF DOPPLER BEACONS ON 5 KH-4 MISSIONS

MAR 70 MISSION 1109 FIRST KH-4 MISSION WITH DOPPLER BEACON - EXTENSIVE COVERAGE OBTAINED

TOP SECRET [REDACTED]



25X1



25X1

TOP SECRET

25X1

25X1

25X1

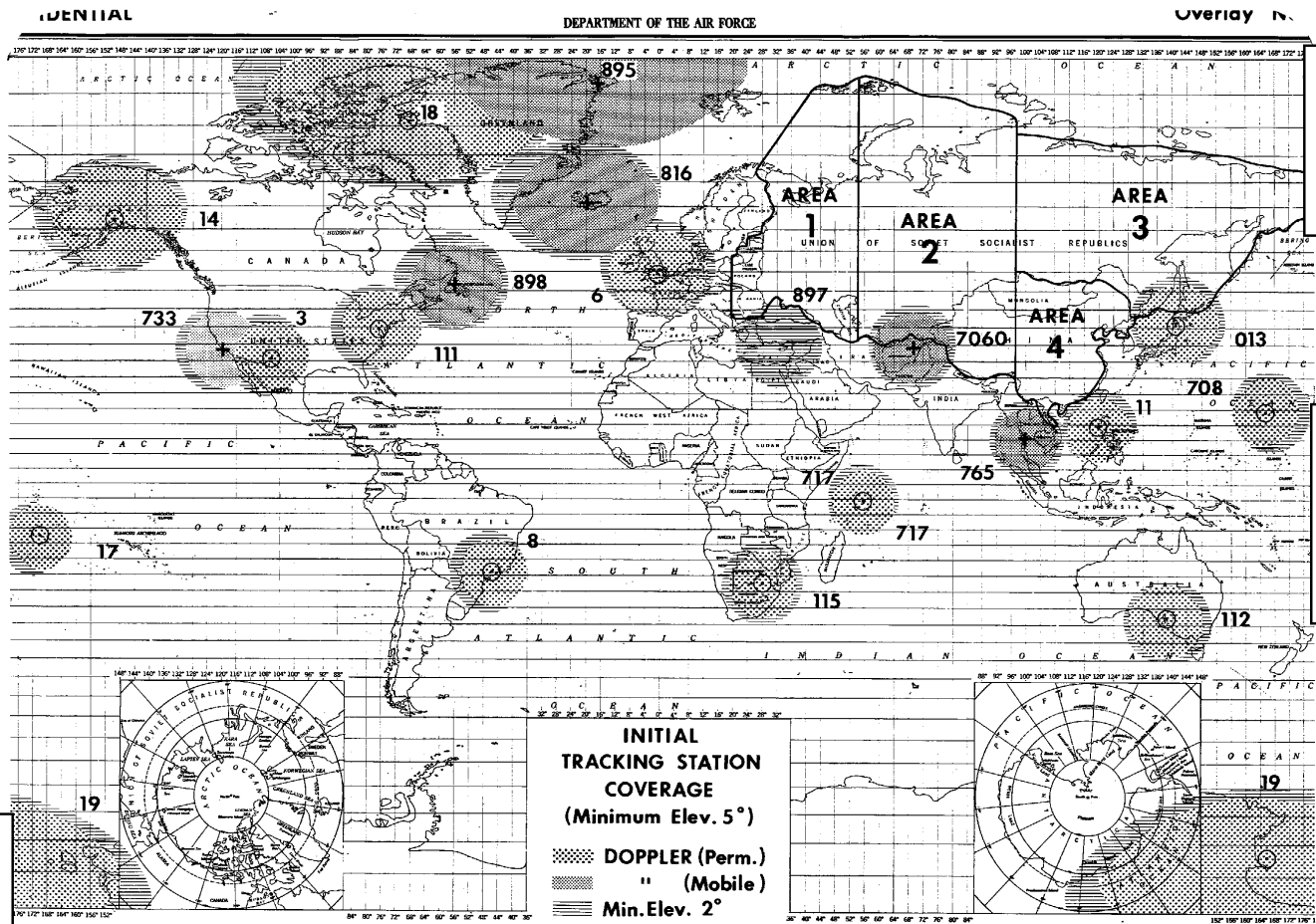
25X1

CONFIDENTIAL

TC5-352465-69

Copy No. 6

A-4a



PRIORITY TARGET AREAS FOR KH-4B/DOPPLER

A-4b

25X1



To

~~25X1~~

tata

25X1

to

1

1

1

1

Approved For Release 2003/05/28 : CIA-RDP79B01709A000400030023-1

SECRET

Target Position Requirement

• CATEGORY I TARGETS •

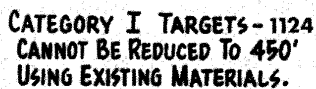
		• PRIMARY •	• MINIMUM •
1431 TARGETS	HORIZONTAL	250 FEET [CE 90%]	450 FEET [CE 90%]
	VERTICAL	150 FEET [LE 90%]	300 FEET [LE 90%]
POSITION ACCURACIES MEETING REQUIREMENTS	HORIZONTAL	2 %	43 %
	VERTICAL	64 %	89 %
MISSILE SILO POSITIONS THAT MEET REQUIREMENT	HORIZONTAL	0 %	31 %
	VERTICAL	56 %	85 %

2, OCT. 1969

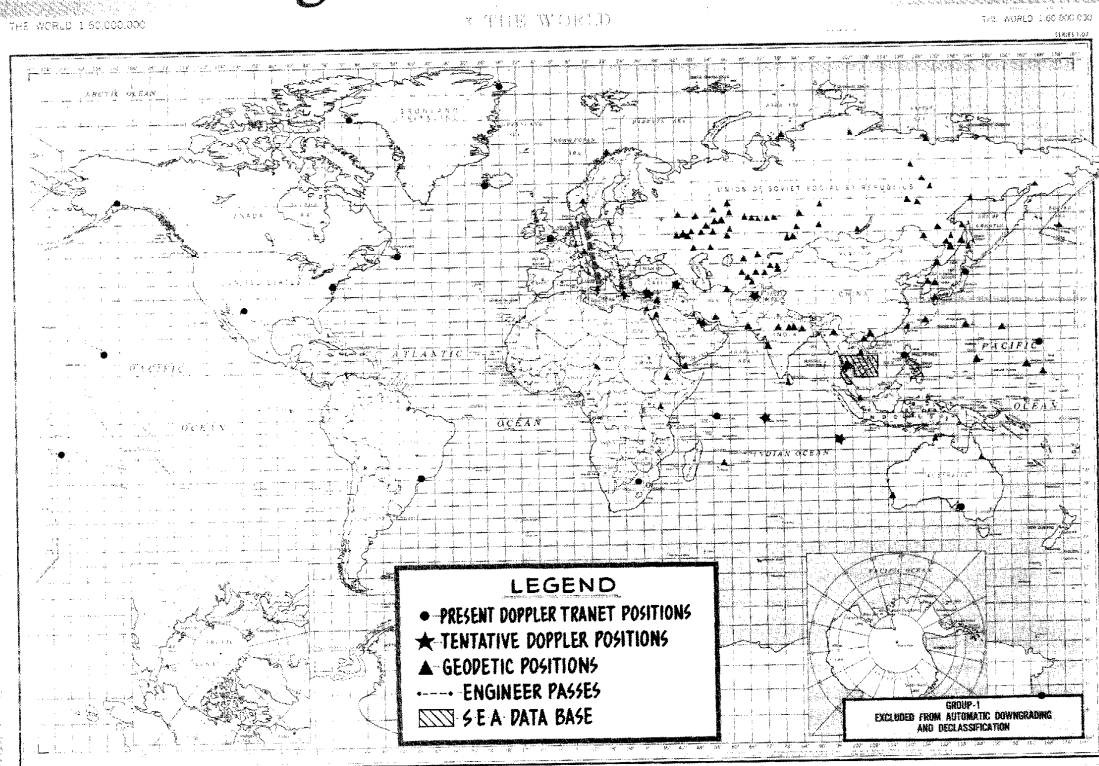
SECRET

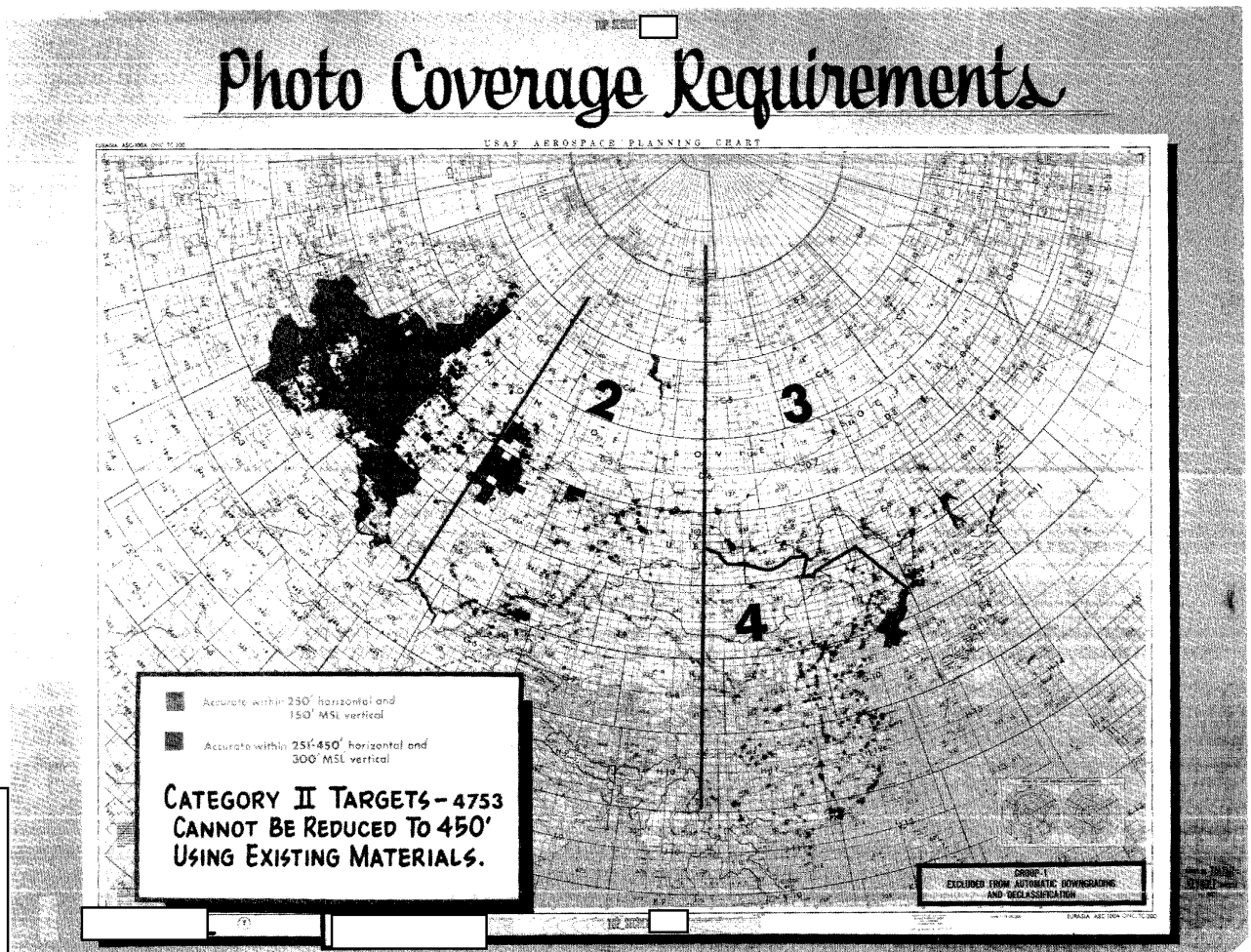
GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

Photo Coverage Requirements



● Photo Coverage Requirements For System Evaluation





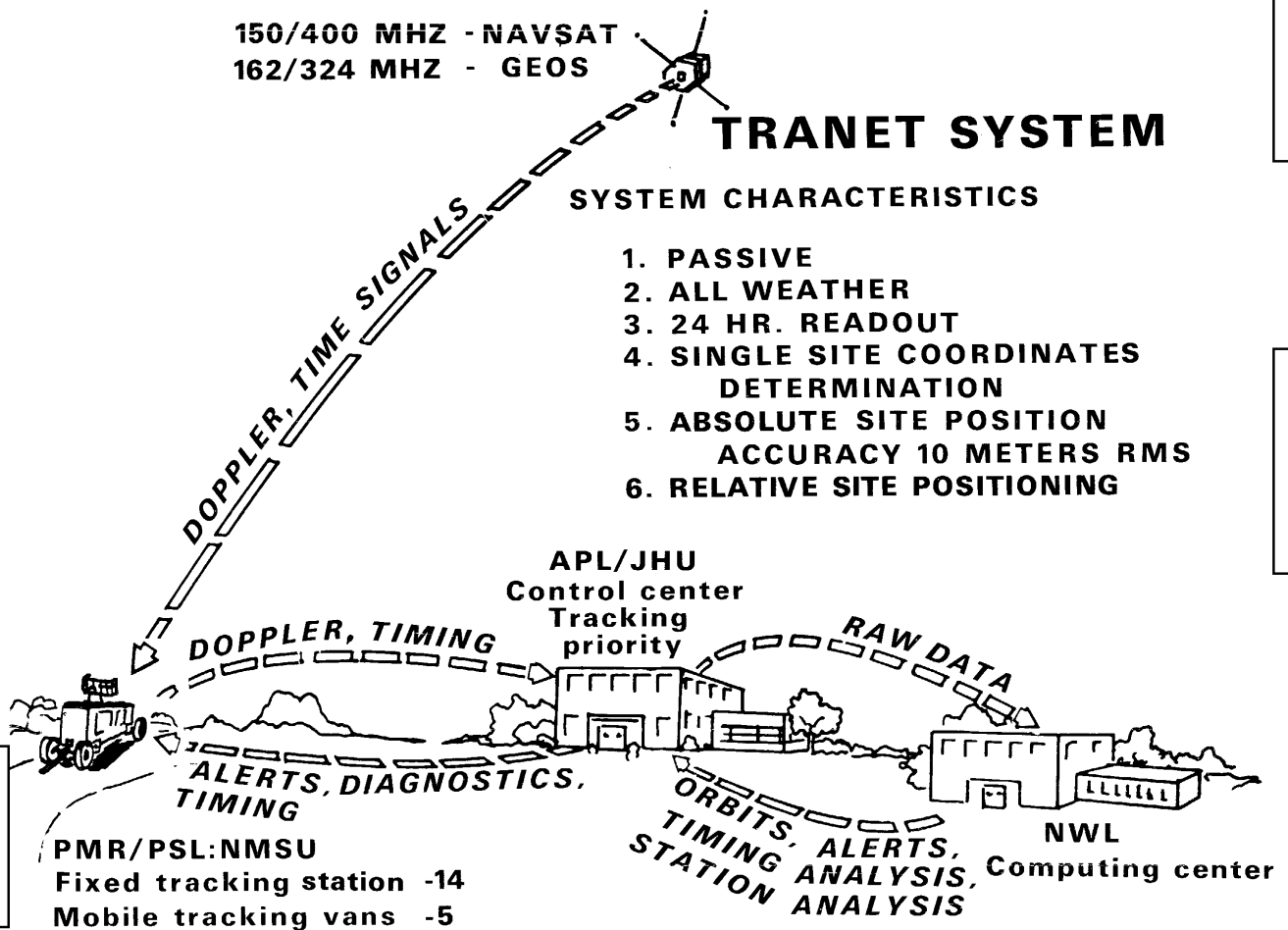
SATELLITE GEOPHYSICS PROJECT

150/400 MHZ - NAVSAT
162/324 MHZ - GEOS

TRANET SYSTEM

SYSTEM CHARACTERISTICS

1. PASSIVE
2. ALL WEATHER
3. 24 HR. READOUT
4. SINGLE SITE COORDINATES
DETERMINATION
5. ABSOLUTE SITE POSITION
ACCURACY 10 METERS RMS
6. RELATIVE SITE POSITIONING



25X1

DOPPLER BEACON 1

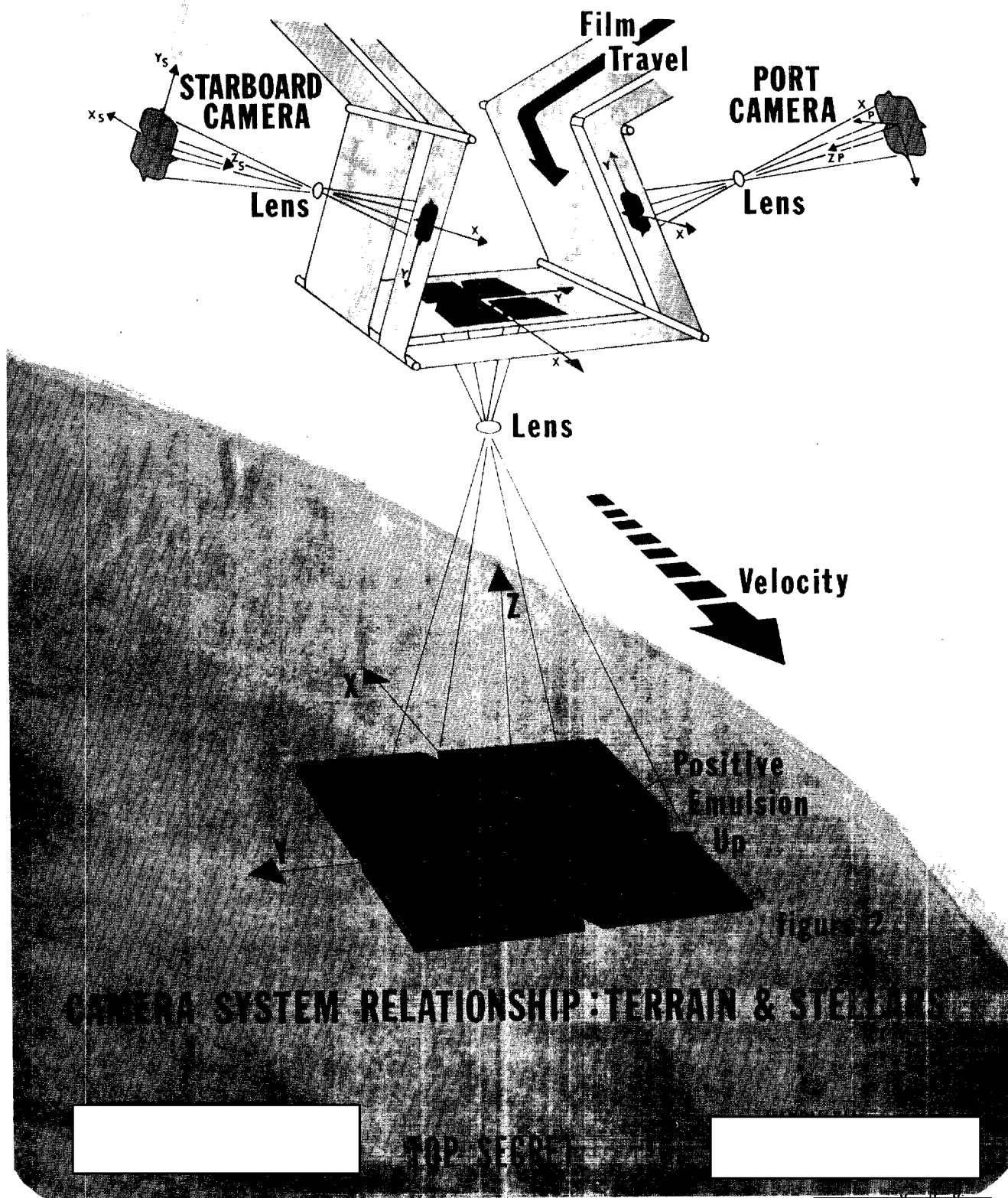
LIFT OFF	4 MARCH	2215 UT	WESTERN TEST RANGE
DOPPLER ON	4 MARCH	2345	REV 1
D.M.U.	5 MARCH	0204	2
	5 MARCH	0420	4
	6 MARCH	1416	27
	8 MARCH	1515	60
	10 MARCH	0726	87
	14 MARCH	0427	150
	18 MARCH	1633	223
DOPPLER OFF	21 MARCH	1439	270
DOPPLER ON	22 MARCH	0700	281
DOPPLER OFF	24 MARCH	1400	325

B-2

25X1

25X1
25X1
25X1

TOP SECRET



25X1

TOP SECRET

25X1

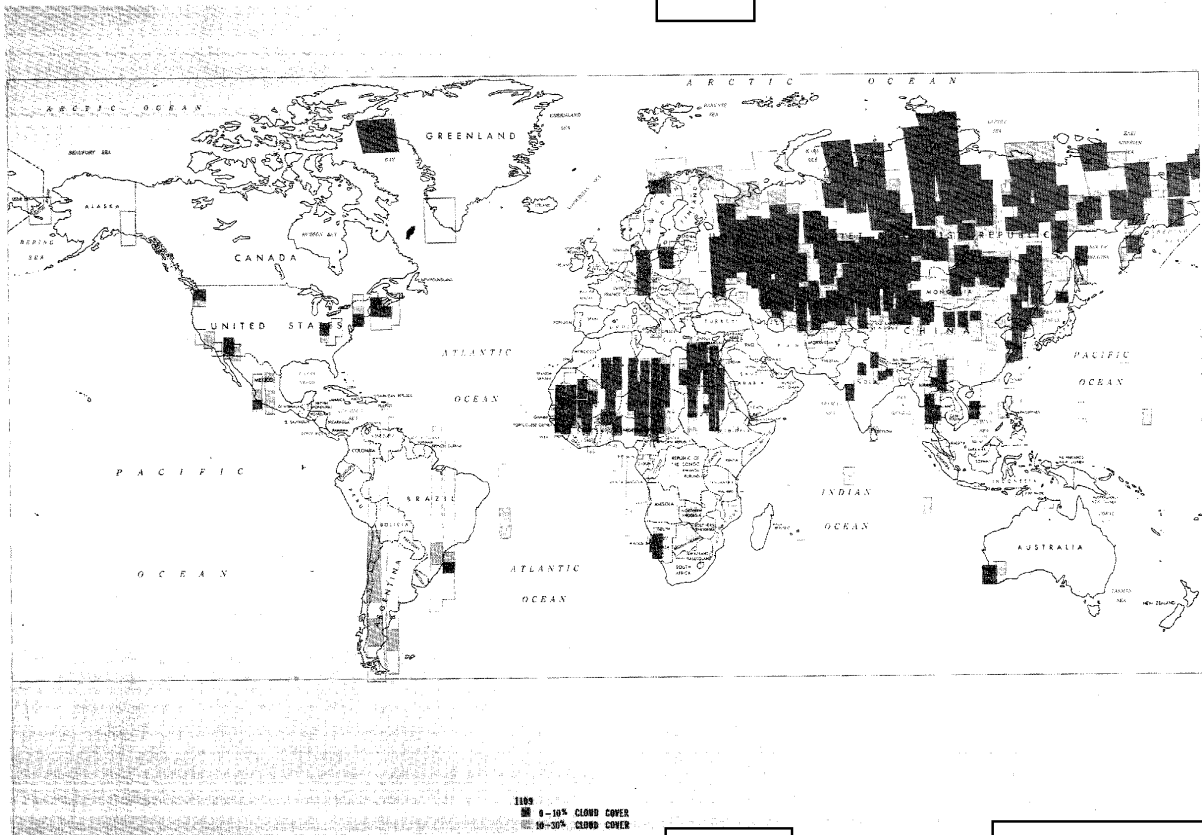
TOP SECRET

25X1
25X1
25X1

25X1

25X1

TOP SECRET



GROUP 1
Excluded from automatic
downgrading and declassification

TOP SECRET

B-4

25X1

25X1

TOP SECRET

Mission Summary Data

	1109 REQMTS	1109 ON/OFF PROGRAM	1109 CLEAR/ STELLAR	1109 EPHEMERIS	1110 REQMTS
CAT I	1124	1077	901	893	243
DIAGNOSTICS	126	112	64	58	294 ^{25X1}
CAT II	4753	4142	2380	2207	2659 ^{25X1}

^{cy} 2

TOP SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

25X1

25X1

TOP SECRET

Alta
en to
25X1

25X1

Ephemeris **EVALUATION** Absolute (PHOTOGRAMMETRIC RESECTION)

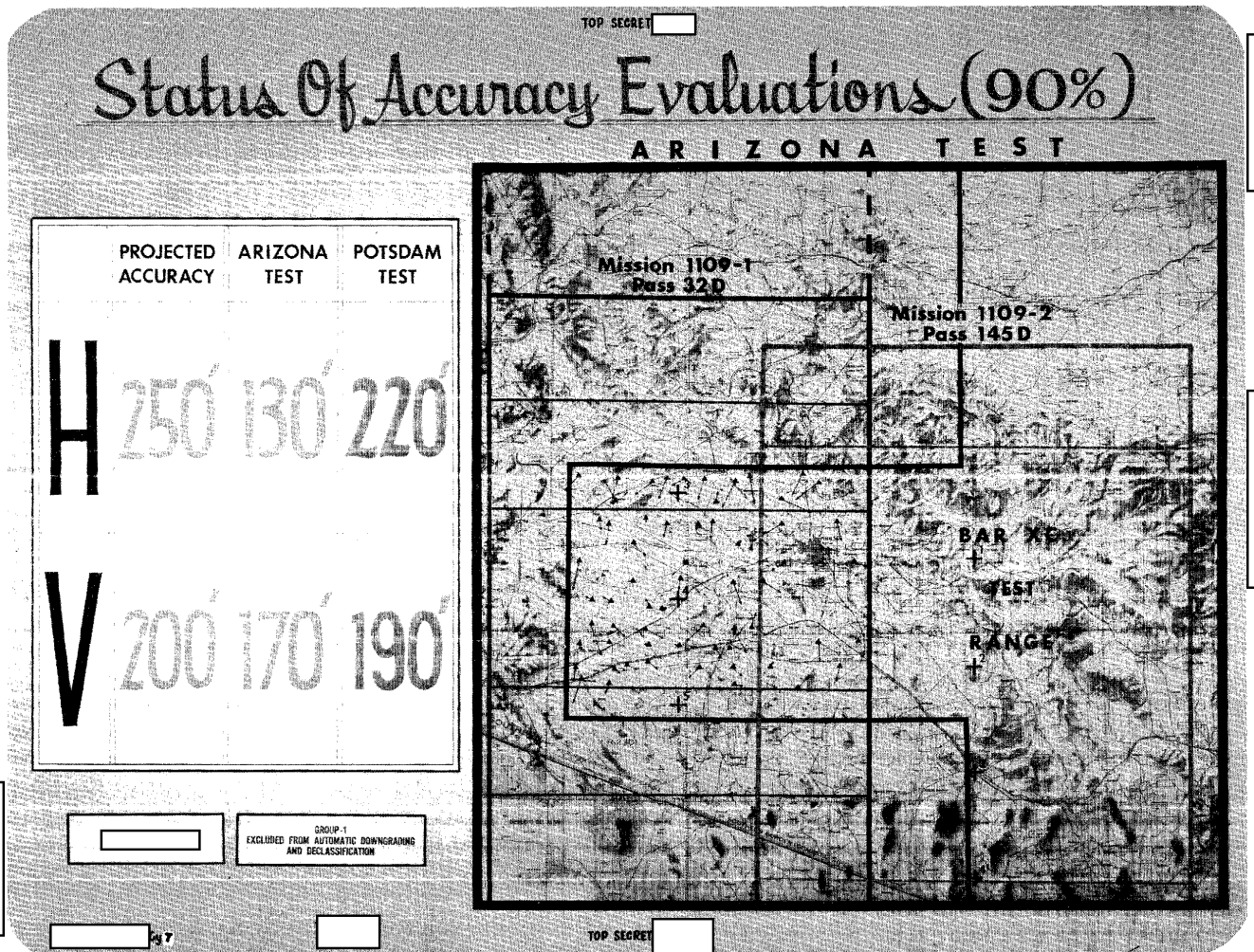
TRAJECTORY → ← DERIVED EXPOSURE STATIONS

GROUND CONTROL
or MAP POINTS

TOP SECRET

TOP SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION



TOP SECRET ☐

Summary

1. OBTAINED GOOD COVERAGE OF 79% OF CAT I REQUIREMENTS; 46% OF DIAGNOSTICS; 46% OF CAT II REQUIREMENTS
2. ACCURACY OBJECTIVES ACHIEVED
3. REQUIREMENTS SUBMITTED FOR MISSION 1110
4. EXPECT TO MEET MINUTEMAN III DEPLOYMENT SCHEDULE REQUIREMENTS

25X1

X1

25X1

TOP SECRET ☐

25X1

Attn:
 ()

25X1

TOP SECRET ☐

25X1
25X1

TOP SECRET ☐

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION